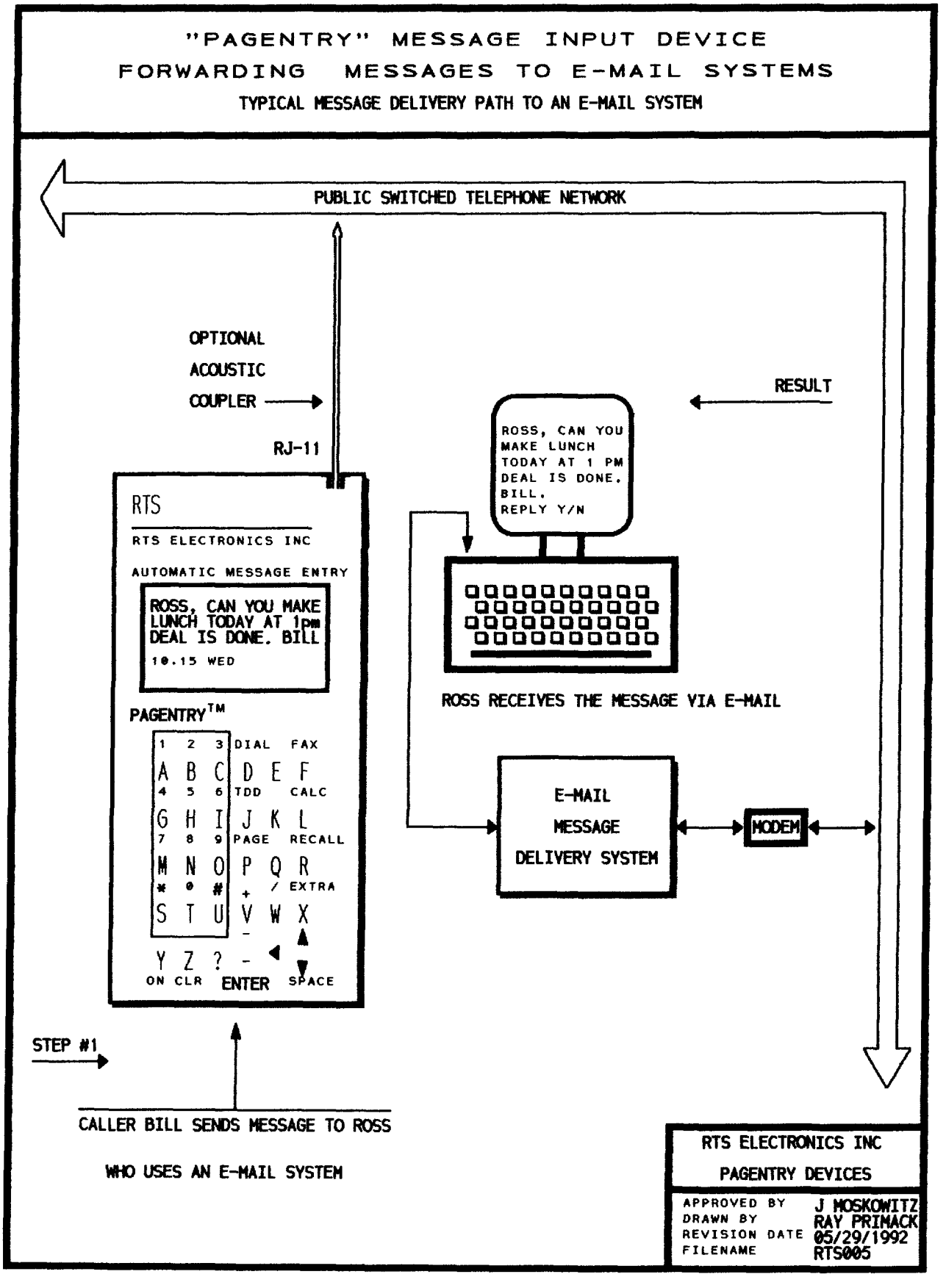
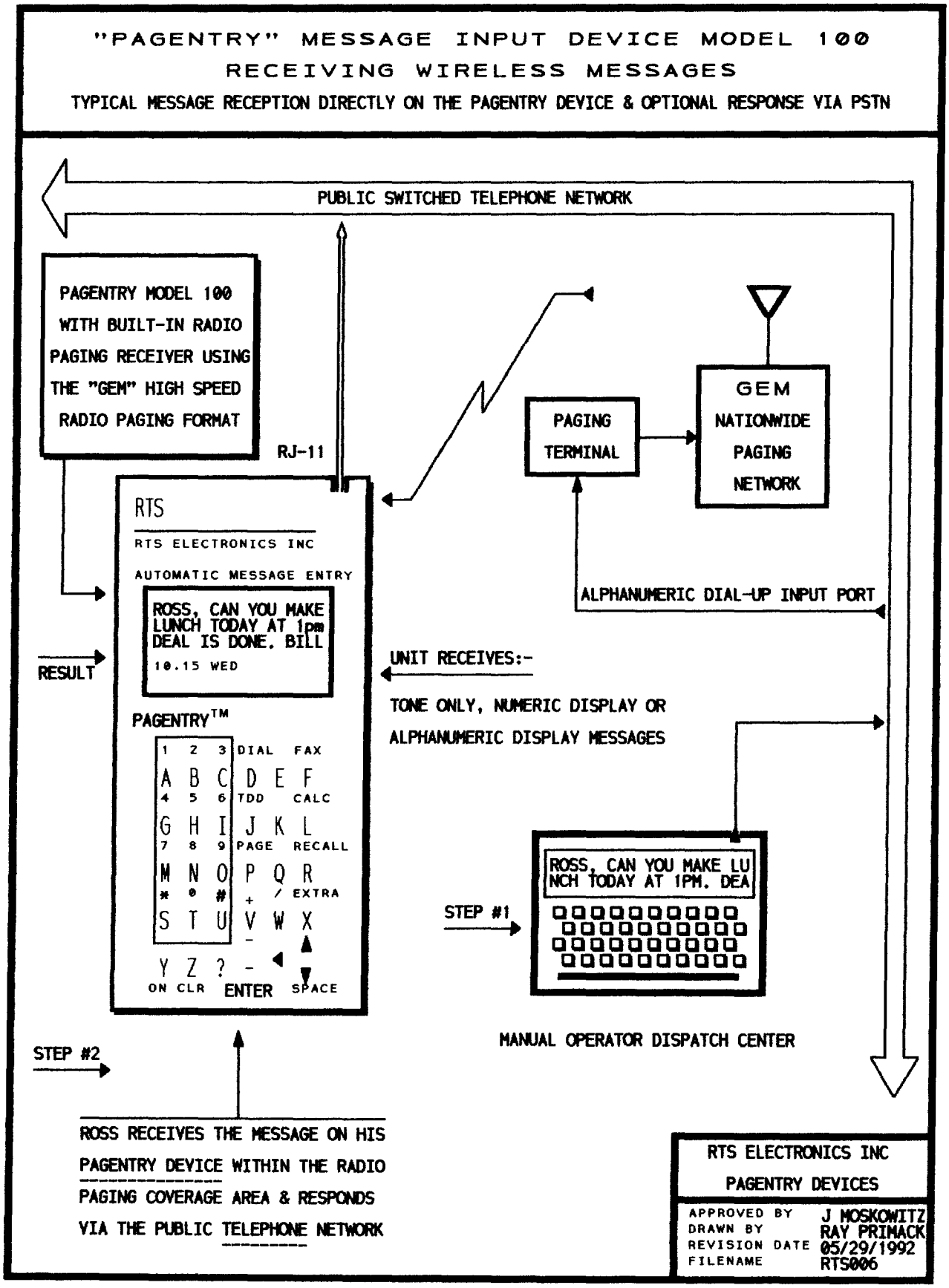
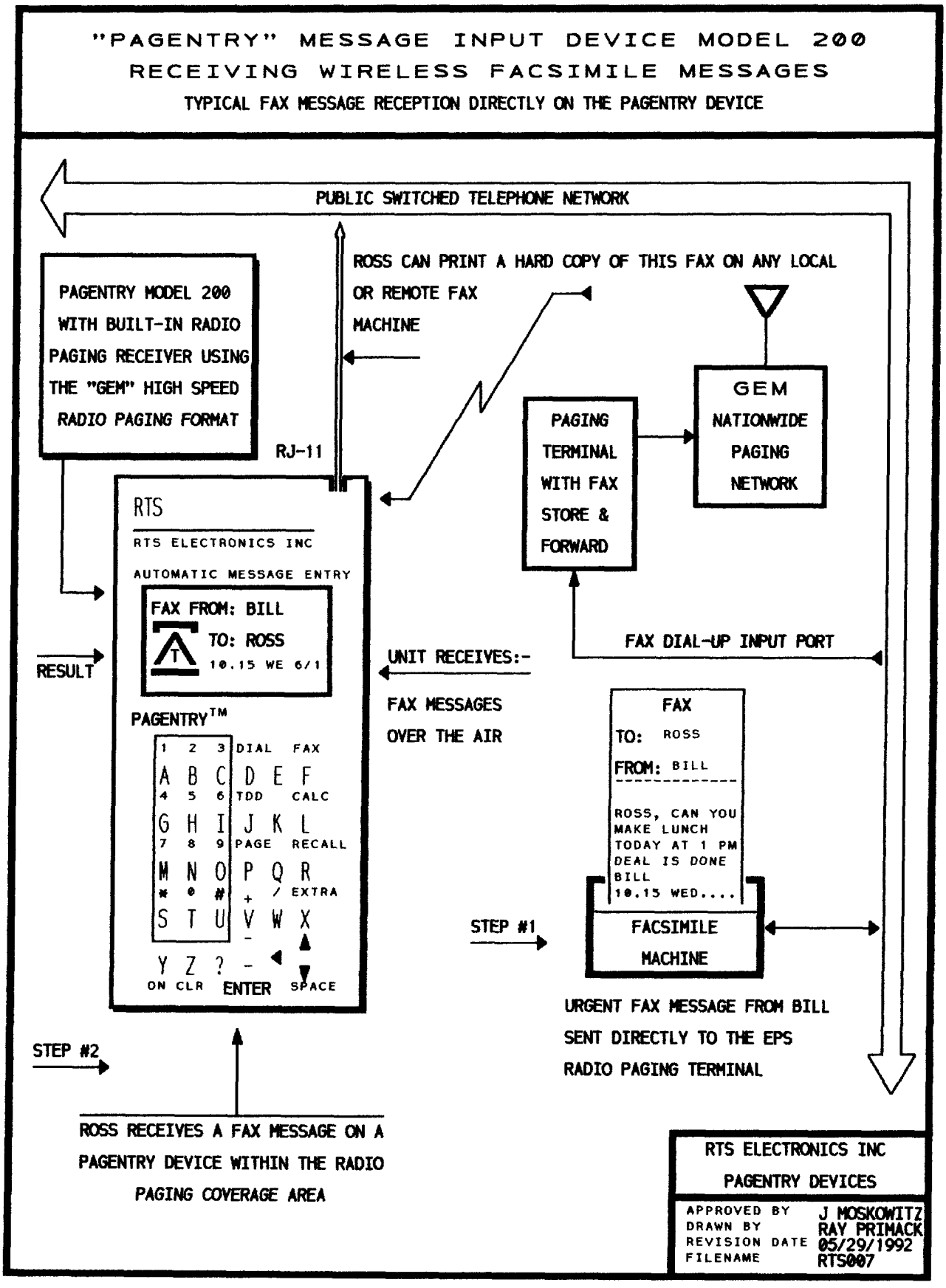
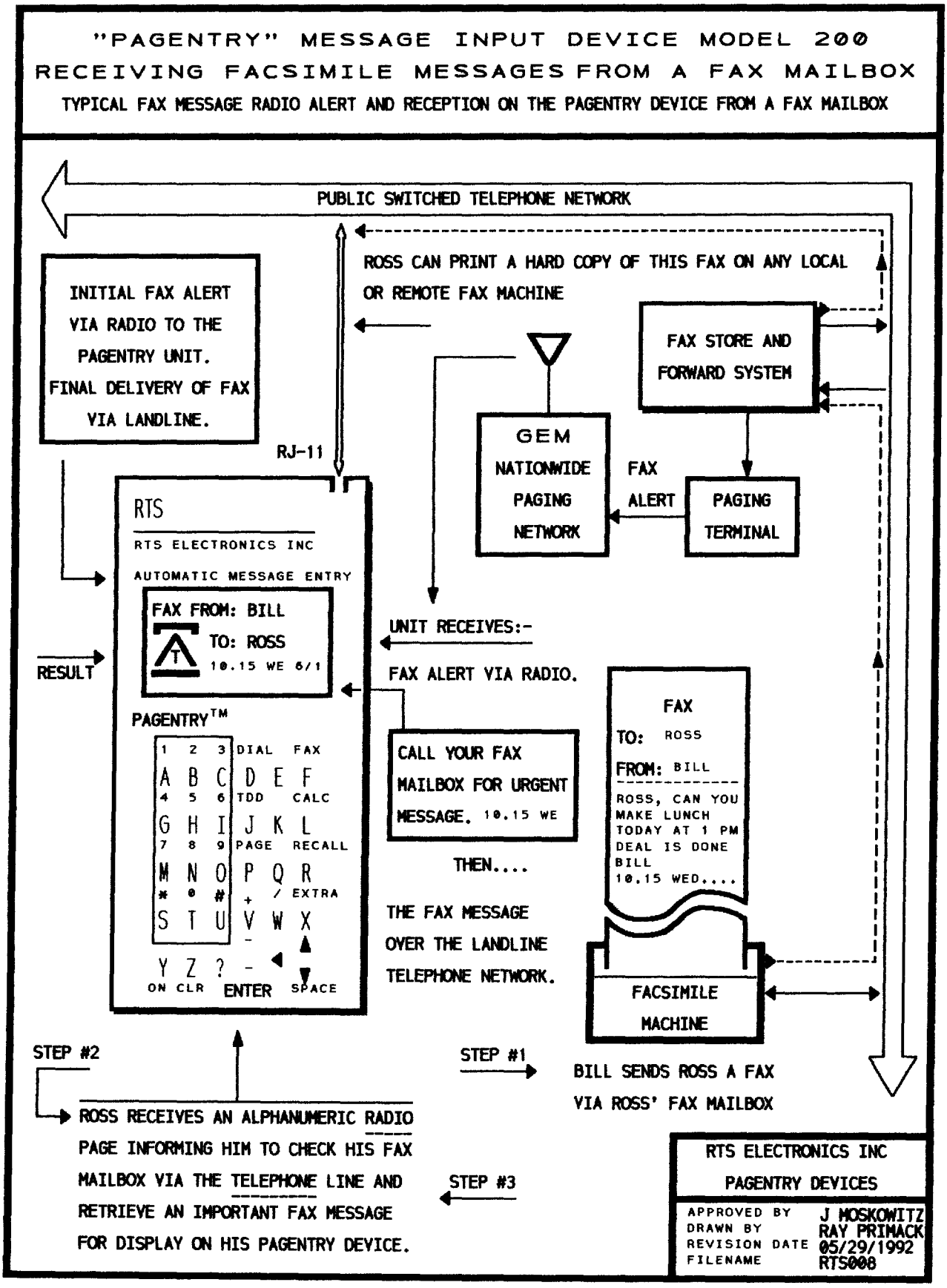

"PAGENTRY" MESSAGE INPUT DEVICE
FORWARDING MESSAGES TO E-MAIL SYSTEMS
TYPICAL MESSAGE DELIVERY PATH TO AN E-MAIL SYSTEM
PUBLIC SWITCHED TELEPHONE NETWORK
OPTIONAL
ACOUSTIC
COUPLER
RJ-11
RESULT
ROSS, CAN YOU MAKE LUNCH TODAY AT 1 PM DEAL IS DONE. BILL. REPLY Y/N
RTS
RTS ELECTRONICS INC
AUTOMATIC MESSAGE ENTRY
ROSS, CAN YOU MAKE LUNCH TODAY AT 1pm DEAL IS DONE. BILL
10.15 WED
PAGENTRY™
1 2 3 DIAL FAX
A B C D E F
4 5 6 TDD CALC
G H I J K L
7 8 9 PAGE RECALL
M N O P Q R
* 0 # + / EXTRA
S T U V W X
- ◄ ▲
Y Z ? - ▼
ON CLR ENTER SPACE
ROSS RECEIVES THE MESSAGE VIA E-MAIL
E-MAIL
MESSAGE
DELIVERY SYSTEM
MODEM
STEP #1
CALLER BILL SENDS MESSAGE TO ROSS
WHO USES AN E-MAIL SYSTEM
RTS ELECTRONICS INC
PAGENTRY DEVICES
APPROVED BY J MOSKOWITZ
DRAWN BY RAY PRIMACK
REVISION DATE 05/29/1992
FILENAME RTS005


"PAGENTRY" MESSAGE INPUT DEVICE MODEL 100
RECEIVING WIRELESS MESSAGES
TYPICAL MESSAGE RECEPTION DIRECTLY ON THE PAGENTRY DEVICE & OPTIONAL RESPONSE VIA PSTN
PUBLIC SWITCHED TELEPHONE NETWORK
PAGENTRY MODEL 100 WITH BUILT-IN RADIO PAGING RECEIVER USING THE "GEM" HIGH SPEED RADIO PAGING FORMAT
RJ-11
PAGING TERMINAL
GEM NATIONWIDE PAGING NETWORK
RTS
RTS ELECTRONICS INC
AUTOMATIC MESSAGE ENTRY
ROSS, CAN YOU MAKE LUNCH TODAY AT 1pm DEAL IS DONE. BILL
10.15 WED
RESULT
ALPHANUMERIC DIAL-UP INPUT PORT
UNIT RECEIVES:-
TONE ONLY, NUMERIC DISPLAY OR ALPHANUMERIC DISPLAY MESSAGES
PAGENTRY™
1 2 3 DIAL FAX
A B C D E F
4 5 6 TDD CALC
G H I J K L
7 8 9 PAGE RECALL
M N O P Q R
* 0 # + / EXTRA
S T U V W X
Y Z ? -
ON CLR ENTER SPACE
STEP #1
ROSS, CAN YOU MAKE LU NCH TODAY AT 1PM. DEA
MANUAL OPERATOR DISPATCH CENTER
STEP #2
ROSS RECEIVES THE MESSAGE ON HIS PAGENTRY DEVICE WITHIN THE RADIO PAGING COVERAGE AREA & RESPONDS VIA THE PUBLIC TELEPHONE NETWORK
RTS ELECTRONICS INC
PAGENTRY DEVICES
APPROVED BY J MOSKOWITZ
DRAWN BY RAY PRIMACK
REVISION DATE 05/29/1992
FILENAME RTS006


"PAGENTRY" MESSAGE INPUT DEVICE MODEL 200
RECEIVING WIRELESS FACSIMILE MESSAGES
TYPICAL FAX MESSAGE RECEPTION DIRECTLY ON THE PAGENTRY DEVICE
PUBLIC SWITCHED TELEPHONE NETWORK
PAGENTRY MODEL 200 WITH BUILT-IN RADIO PAGING RECEIVER USING THE "GEM" HIGH SPEED RADIO PAGING FORMAT
ROSS CAN PRINT A HARD COPY OF THIS FAX ON ANY LOCAL OR REMOTE FAX MACHINE
RJ-11
PAGING TERMINAL WITH FAX STORE & FORWARD
GEM NATIONWIDE PAGING NETWORK
RTS
RTS ELECTRONICS INC
AUTOMATIC MESSAGE ENTRY
FAX FROM: BILL
TO: ROSS
10.15 WE 6/1
RESULT
PAGENTRY™
FAX DIAL-UP INPUT PORT
UNIT RECEIVES:-
FAX MESSAGES OVER THE AIR
FAX
TO: ROSS
FROM: BILL
ROSS, CAN YOU MAKE LUNCH TODAY AT 1 PM
DEAL IS DONE
BILL
10.15 WED....
STEP #1
FACSIMILE MACHINE
URGENT FAX MESSAGE FROM BILL SENT DIRECTLY TO THE EPS RADIO PAGING TERMINAL
STEP #2
ROSS RECEIVES A FAX MESSAGE ON A PAGENTRY DEVICE WITHIN THE RADIO PAGING COVERAGE AREA
RTS ELECTRONICS INC
PAGENTRY DEVICES
APPROVED BY J MOSKOWITZ
DRAWN BY RAY PRIMACK
REVISION DATE 05/29/1992
FILENAME RTS007


"PAGENTRY" MESSAGE INPUT DEVICE MODEL 200
RECEIVING FACSIMILE MESSAGES FROM A FAX MAILBOX
TYPICAL FAX MESSAGE RADIO ALERT AND RECEPTION ON THE PAGENTRY DEVICE FROM A FAX MAILBOX
PUBLIC SWITCHED TELEPHONE NETWORK
INITIAL FAX ALERT VIA RADIO TO THE PAGENTRY UNIT. FINAL DELIVERY OF FAX VIA LANDLINE.
ROSS CAN PRINT A HARD COPY OF THIS FAX ON ANY LOCAL OR REMOTE FAX MACHINE
FAX STORE AND FORWARD SYSTEM
GEM NATIONWIDE PAGING NETWORK
FAX ALERT
PAGING TERMINAL
RJ-11
RTS
RTS ELECTRONICS INC
AUTOMATIC MESSAGE ENTRY
FAX FROM: BILL
TO: ROSS
10.15 WE 6/1
PAGENTRY™
1 2 3 DIAL FAX
A B C D E F
4 5 6 TDD CALC
G H I J K L
7 8 9 PAGE RECALL
M N O P Q R
* 0 # + / EXTRA
S T U V W X
- ▲
Y Z ? - ◀ ▼
ON CLR ENTER SPACE
RESULT
UNIT RECEIVES:-
FAX ALERT VIA RADIO.
CALL YOUR FAX MAILBOX FOR URGENT MESSAGE. 10.15 WE
THEN....
THE FAX MESSAGE OVER THE LANDLINE TELEPHONE NETWORK.
FAX
TO: ROSS
FROM: BILL
ROSS, CAN YOU MAKE LUNCH TODAY AT 1 PM DEAL IS DONE BILL
10.15 WED....
FACSIMILE MACHINE
STEP #2
ROSS RECEIVES AN ALPHANUMERIC RADIO PAGE INFORMING HIM TO CHECK HIS FAX MAILBOX VIA THE TELEPHONE LINE AND RETRIEVE AN IMPORTANT FAX MESSAGE FOR DISPLAY ON HIS PAGENTRY DEVICE.
STEP #3
STEP #1
BILL SENDS ROSS A FAX VIA ROSS' FAX MAILBOX
RTS ELECTRONICS INC
PAGENTRY DEVICES
APPROVED BY J MOSKOWITZ
DRAWN BY RAY PRIMACK
REVISION DATE 05/29/1992
FILENAME RTS008

30. Two-way paging communication. Pagentry has one additional benefit which arises from its portability. Alphanumeric paging subscribers who also have Pagentry units have the capability of sending responses to alphanumeric pages. The Pagentry Models 100 and 200 combine these capabilities into a single unit. Therefore, through the use of Pagentry with a GEM system, two mobile individuals will have the capability of having two-way non-real time communications, by utilizing wireless reception and landline forwarding of responses.

31. The effect of GEM on system capacity. What will happen when alphanumeric traffic begins to reach its true potential? Providing an alphanumeric paging service today can be a short-term plus and a long-term threat for a paging carrier. On the one hand, carriers realize that the value associated with the forwarding of immediate messages will generate a higher revenue stream than that which is achievable in numeric only paging. On the other hand, these carriers realize that as alphanumeric paging begins to grow, their channel capacity will readily be consumed. Largely because of design and speed limitations, current radio paging formats do not process alphanumeric paging as efficiently as possible. Accordingly, the total subscriber capacity of a single channel can quickly reach saturation. Alphanumeric pages utilize much more airtime than do numeric only pages. Unfortunately, in today's marketplace carriers cannot charge for alphanumeric

paging services based upon the amount of airtime utilized. It is therefore often more profitable to add several numeric only subscribers rather than a single alphanumeric subscriber, because the income generated by the numeric customers exceeds that generated by the alphanumeric customer.

32. GEM proposes to utilize a paging transmission speed of 6,250 bits per second. Paging systems currently operate at 300, 512, 600, 1,200, and a maximum of 2,400 bits per second. In addition to utilizing higher data transmission rates, GEM will utilize a paging format which is more greatly optimized for the transmission of alphanumeric paging traffic. This combination will provide overall channel loading capabilities at least 30% greater than those which would be achievable by only increasing data transmission speeds.

33. The combination of GEM and the advanced Pagentry radio paging receivers will allow alphanumeric paging to achieve its attainable market penetration. GEM will thereby provide the public with superior service and carriers with an enhanced revenue stream which encourages further service improvements and expansion of paging networks into larger geographical service areas.

34. Given current technology, the capacity of existing radio paging channels would be exhausted long before the market potential for alphanumeric paging is reached. A 400 character alphanumeric message sent to a normal POCSAG 512 bit-

per-second pager takes approximately 10 seconds of airtime. This is equivalent to the airtime which was allocated per page on the original voice paging systems which were heavily utilized in the early days of paging. Although a numeric only system could easily service 50,000 subscribers over a 25 kHz radio channel, only 2,000 voice paging subscribers are typically supported over the same channel. Therefore, when large alphanumeric messages are transmitted, the overall subscriber capacity of a channel is severely diminished.

35. Use of a paging format in excess of 6,000 bits per second will do more than just support higher volumes of alphanumeric traffic. GEM will be supporting two major services which will be sending more data than is typical of an alphanumeric page. GEM will support the transmission of small and large volumes of binary data to remote receivers. These receivers are expected to be connected to laptop, palmtop, and other reportable computing devices. It is expected that GEM will support a new Telocator sponsored industry standard communication protocol which is currently being defined, for the purposes of sending binary data through paging networks to portable receivers. The binary data transmitted could be Lotus type spreadsheet updates, appointment calendar information, electronic mail messages, data base updates, and even computer programs.

36. GEM will also support the Pagentry Model 200, which is described in more detail elsewhere in this document. This variation of the Pagentry product will be capable of receiving and displaying facsimile messages which are transmitted as binary data through GEM.

37. With higher speed paging the number of bits per second which is transmitted over the air is increased, thereby allowing the channel to support additional subscriber messages. The original POCSAG 512 bit-per-second format has widely been implemented in a 1,200 bit per second format, thus increasing overall channel capacity beyond that of the original paging format. Experimentation continues with a 2,400 bit-per-second variation of POCSAG, which when fully proven will further increase the channel capacity. When the transmission rate of a given paging format is doubled, then the overall channel capacity is doubled. But other factors having to do with pager alert and reception reliability as well as pager battery life could be adversely effected by merely doubling the data rate. When designing a higher speed paging format, the designer must consider these factors in order to provide at least the same degree of reliability and at least the equivalent pager battery life as with lower speed formats. In addition, if the new high speed format must co-exist with pagers which utilize other

paging formats, then the designer must insure that the new format does not adversely affect other pagers on the same channel.

The need to dedicate paging channels for high speed paging

38. If a high speed format is required to share an existing channel, then its overall effectiveness is compromised in a number of different ways. First, the maximum channel loading can never be achieved because slower formats are wasting airtime. Furthermore, the switching from one format to the other wastes additional airtime in moving from one data transmission format to another in a manner which is recognized by the paging receivers which must synchronize themselves to the transmission. Maximum pager battery life can never be achieved when a mixture of paging formats share a common channel. Pagers typically go into low-power modes for short periods of time when they "know" that they are not going to be alerted by the paging terminal. When mixing different paging formats in an unpredictable manner dictated by the mix of callers and the types of paging formats utilized by their receivers, the pager loses the ability to accurately "know" when it is allowed to remain in the lower power mode. Battery life is greatly reduced the longer a pager remains in its full power mode. When a mix of formats are in use, the pager must remain at full power until information transmitted in its own paging format indicates that it may return to lower power mode

for a period of time. It is for these reasons that GEM will be dedicated to a single high speed paging format. This will not only provide the maximum channel capacity achievable at the given data rate, but it will also maximize the battery life of the paging receivers.

Features of the GEM Paging Format

39. The GEM paging format is capable of transmitting tone only, numeric, alphanumeric and binary data to remote receivers. It will also be utilized to transmit urgent fax messages over-the-air through its binary data transmission capabilities. The Pagentry Model 200 paging receiver will be capable of receiving and displaying these fax messages as well as tone only, numeric and alphanumeric pages.

40. GEM will utilize 4-level Frequency Shift Keying transmitted at 3,125 baud. This modulation technique transmits 2 bits per baud, resulting in an over-the-air data transmission rate of 6,250 bits per second. Extensive testing of this type of modulation has already been performed in Europe, since the ERMES[5/] over-the-air paging format utilizes this technique.

5/ The European Radio Message Standard (ERMES) is a new standard which was developed by a subcommittee of the European Telecommunications Standards Institute (ETSI), which is responsible for all communication standards throughout Europe. When fully implemented, ERMES is expected to operate in more than 16 European countries which a combined population of more than 320 million. In January 1990, 26 operators from 16 countries signed a Memorandum of Understanding indicating their agreement to create a service based upon this standard. The standard (continued...)

In addition, Pactel Paging has been testing transmission of data at 3,125 baud pursuant to Commission grant in February of 1991 of an Experimental Radio Service authorization to Pacific Telesis Group.[6/] Preliminary results of this testing have shown that paging at this data rate in the 930-931 MHz range is very acceptable for use in a high speed paging format.[7/]

41. GEM is a derivative of the ERMES over-the-air paging format. It is similar to ERMES in several ways:

- GEM continually transmits information in a synchronous manner, so that pagers may precisely turn on at predefined intervals which are microseconds prior to the point in time when they could expect to be paged.
- The format is designed to notify the paging receiver as quickly as possible that its pager identification number is not going to be alerted during this transmission interval. This technique will maximize the battery life of the paging receiver.

5/(...continued)
has been in development for several years and a great deal of experimentation by manufacturers and European Postal Telephone and Telegraph Companies has gone into the testing of the new over-the-air paging format and the radio receivers which will be utilized.

6/ Data transmission experiments in the 930-931 MHz range have been conducted under File Numbers 1658-EX-PL-90, 1659-EX-PL-90, 1660-EX-PL-90, 1661-EX-PL-90 and 1662-EX-PL-90. Permission to transfer this experimental authorization to another subsidiary was filed under FCC File No. 1934-EX-TC-91.

7/ As reported by James Lawson, VP-Technical Operations, Pactel Paging, at the Telocator Paging Technical Committee, High-Speed Paging Subcommittee meeting in Dallas, Texas on May 20, 1992.

- The format includes message sequence numbers with every non-group called page. This permits the paging receiver to automatically detect missing messages. The GEM paging terminal allows the user to call in and order a retransmission of missing messages or to retrieve the numeric or alphanumeric message in voice form over the telephone. Alphanumeric message retrieval via voice utilizes state-of-the-art text-to-speech techniques which are part of the technology already utilized in equipment developed by the applicant. (See the DataSpeak^{tm} information appended hereto as Attachment 4). DataSpeak utilized text-to-speech for verification of alphanumeric message input.[8/]

- Binary data messages can be transmitted in small batches over a long period of time, thereby avoiding the allocation of valuable airtime to single messages which could potentially consume an inordinate amount of transmission time.

- Pages are simulcast over the coverage area. Transmitter synchronization is maintained within the acceptable tolerance of the receiving format through the utilization of timing signals derived from GPS receivers.

42. In other ways, GEM differs from ERMES:

- GEM utilizes more advanced forward error corrected codes which provide a greater degree of error detection and correction.

- GEM interleaves paging data over a longer period of time, thereby reducing the probability that burst radio errors will corrupt information sent over-the-air.

- GEM utilizes the Alpha-Tone^{tm} representation of Alphanumeric paging data rather than the 7-bit representation which is currently used in POCSAG and ERMES. Alpha-Tone is a technique which is capable of representing alphanumeric data in

---

8/ This capability was demonstrated to Commissioner Marshall during the spring 1990 Telocator convention in San Diego.

approximately 30% fewer bits than that of the POCSAG, ERMES and other radio paging data formats. Alpha-Tone is fully described in a pending U.S. patent application submitted by Real Time.[9/] The technique will be made available to the Joint Venture and through licensing to other parties which wish to offer GEM service. The utilization of this technique in order to send alphanumeric pages further increases the number of subscribers that can be supported on a single channel. Each individual alphanumeric page will consume even fewer bits with the higher speed of transmission, resulting in the support of far more paging subscribers than can be accommodated on any pre-existing paging channel.

- GEM is a single frequency service, as opposed to ERMES sixteen-channel implementation. Therefore, the GEM format does not require extra transmission bits as are required in a multi-channel implementation.

43. Customer capacity can be increased markedly using the GEM format. The Telocator High Speed Paging Committee has been studying radio paging formats for some time. The highest speed paging format, just coming into commercial use today, is the 2400 baud version of POCSAG. During the April 1, 1992 High Speed Paging Committee meeting in Washington, D.C., during Telocator's "Future of Paging" conference, an analysis was presented which compared the channel capacity of a network which is utilizing 2400 baud

---

9/ Because of the pending patent application, the Joint Venture is limited as to the extent of detail which it may disclose concerning the proprietary technology and features of the devices. The Joint Venture has, however, here provided sufficient information concerning the nature of the technology and features and detailed information concerning the services which can be provided to show the technical feasibility of GEM service.

POCSAG with the channel capacity of a 6,250 bit-per-second ERMES paging channel. The complete analysis presented during that meeting is set forth at Attachment 5. In this analysis, the maximum number of 2400 baud POCSAG pages per second and 6,250 bit-per-second ERMES pages per second is derived for tone-only, numeric, and alphanumeric paging. Of particular interest when comparing both POCSAG-2400 and ERMES to the GEM format is the maximum capacity of an all alphanumeric paging service.

44. In the alphanumeric paging analysis, it is shown that pages containing 48 characters of alphanumeric data can be transmitted at 3.78 pages per second or 13,608 pages per hour in POCSAG and at 8.3 pages per second or 29,880 pages per hour in ERMES. The analysis shows also that large alphanumeric messages of 200 characters can be transmitted at the following rates:

POCSAG: 0.96 pages per second or 3,456 pages per hour

ERMES: 2.33 pages per second or 8,388 pages per hour

For simplistic comparison purposes, it will be assumed that the general GEM format was similar to the ERMES format and can also send up to 191 codewords per second, as shown in Section 7.2 of the analysis. In reality, because GEM is a single frequency, non-scanning format, the format actually contains less overhead bits than ERMES. Therefore this analysis is conservative.

45. The Alpha-Tone format used to represent alphanumeric information generates an average of 30% fewer bits than used in the POCSAG or ERMES formats. The technique which results in this significant savings is described in detail in RTS' pending patent submission. The following evaluation should be considered just after Sections 7.3 and 7.4 in the attached analysis which was presented at the Telocator meeting.

46. At GEM paging rates a 48 character alphanumeric page is one address codeword, two message header codewords, 14 message codewords, and one message terminator, for a total of 18 codewords, while a 200 character alphanumeric page is 59 codewords. Therefore, the maximum rate for alphanumeric paging is 10.61 pages per second for 48 character messages and 3.24 pages per second for 200 character messages.

47. POCSAG, ERMES, and EPS may be compared as follows:

Paging Rate Per Second

	POCSAG	ERMES	GEM
48	3.78	8.3	10.61
200	0.96	2.33	3.24

Maximum Number of Pages Per Hour

Message Size	POCSAG	ERMES	GEM
48	13,608	29,880	38,196
200	3,456	8,388	11,664

48. These figures can be converted back to show the customer capacity on a purely alphanumeric paging channel. The assumption is made herein that customers send an average of 2.5 pages per day and that 20% of the calls come into the system during the busy hour. Each customer will therefore place 0.5 pages during the busy hour. The maximum subscriber capacity of the channel is therefore:

Maximum Subscriber Capacity

Message Size	POCSAG	ERMES	GEM
48	27,216	59,760	76,392
200	6,912	16,776	23,328

49. As this chart shows, for an all alphanumeric paging service of 48 character messages, the GEM format will allow 2.8 times as many customers to be serviced than could be achieved by a channel transmitting 2400 baud POCSAG. For an alphanumeric paging service of 200 character messages, the GEM format will allow 3.4 times as many customers to be services than could be achieved by a channel transmitting 2400 baud POCSAG. The chart also shows that there is a 30% to 40% improvement in channel loading using GEM over what would have been achieved solely by increasing the channel speed to support ERMES. The GEM format loads more customers on a channel than speed alone can achieve. Table 1 in the appended analysis shows the maximum customer loading capacity given a mixture of tone-only, numeric, and alphanumeric paging traffic on a single channel. The analysis shows that in the Alpha/E-mail scenario an ERMES channel was able to achieve a 135% improvement in channel capacity over POCSAG. The GEM format increases the channel capacity to 90.0k customers, or an extraordinary 171% improvement in channel loading over POCSAG-2400.

50. Section III reviewed the features, capabilities, and services provided by the initial version of the Pagentry product. A pending patent application relates to the capabilities of the Pagentry product, the Alpha-Tone technique, as well as other areas which are the subject of this filing.

51. The initial version of Pagentry was developed to provide a low cost means to input alphanumeric paging information. RTS is the developer of the Pagentry technology and the proponent of the pending patent application. Message Center is the operator of one of the largest privately held radio paging companies in the United States. This unique combination of technological capabilities, operational experience, and financial resources gives the Joint Venture the ability to delivery the advances of GEM to the marketplace.

52. GEM will utilize a variation of the basic Pagentry product in order to provide new and innovative services for the mobile individual. Pagentry will be expanded to include radio reception capabilities under the GEM paging format. The two major Pagentry models will be utilized as the primary GEM receivers. Both models will provide all of the features and capabilities of the basic Pagentry product described herein.

Pagentry Model 100

53. The Pagentry Model 100 is also a hand-held message entry device, combining all of the basic Pagentry

functions along with the ability to receive over-the-air information transmitted in the GEM paging format. This model will specifically be capable of receiving tone-only, numeric, and alphanumeric paging data. Display pages can be reviewed through an integral multi-line display. With storage in excess of 50,000 characters, the Model 100 is capable of holding hundreds of numeric and alphanumeric messages.

54. When an urgent message is received over-the-air and reviewed by the subscriber, the landline communications capability may be utilized to respond to the message. The subscriber may prepare a textual response to an urgent radio page on the Model 100 itself. Like the non-paging version of Pagentry, the Model 100 may be connected to the landline telephone network via its RJ-11 modular jack or may be acoustically coupled to a pay telephone. The subscriber may then forward the textual response in any of several different ways:

- A textual response may be sent to a remote radio paging terminal for forwarding to the caller's alphanumeric pager or Pagentry receiver;
- a textual response may be sent to a facsimile machine which is accessible to the caller; or
- An electronic mail message may be transmitted to the caller's Pagentry device (any model) if it is connected to the telephone network.

55. The Pagentry Model 100 is effectively a receiver which, among other advanced functions, provides the ability to perform "acknowledgement paging" without the allocation of

additional radio spectrum. The concept and benefits of acknowledgement paging are the subject of another request for a pioneer's preference in File No. PP-35.

56. Two mobile individuals who each have a Model 100 will have the capability to send textual messages to each other. Such a message transfer is not performed in real time (not instantaneous and interactive), yet it effectively allows information to be exchanged between individuals on the go.

57. The Model 100 reduces the spectrum requirements for two-way communication to 50% of that which would be required if a fully wireless system were employed. By eliminating the wireless return path, the cost of the Model 100 is lower than that which would be achievable if it also contained a low-power radio transmitter. In addition, because there is no wireless return path, the investment in the radio network infrastructure is a fraction of the cost of installing and maintaining a vast network of radio receivers in order to pick up the weak signals being transmitted by low-power radio devices.

Pagentry Model 200

58. The hand-held Pagentry Model 200 has all of the capabilities of the Model 100 with the additional capability of receiving and displaying facsimile messages. The integral display utilized in the Model 200 has high resolution graphics capabilities which allow both graphical and textual information

to be displayed and reviewed. Since the size of the integral display is smaller than that of the documents which are faxed to the unit, the Model 200 employs sophisticated windowing techniques to allow the subscriber to scan the textual and graphical facsimile message on a small display screen.

59. The Model 200 is capable of receiving fax messages in either of two ways. Time critical documents of an urgent nature may be transmitted to the Model 200 over-the-air via the GEM paging format. Because of the nature of this paging format, a fax message is broken into smaller transmission blocks and is transmitted in bursts to the Pagentry receiver. Multiple fax messages can be simultaneously received at one time, since the unit can receive and reassemble the data blocks coming for different fax messages. Several fax messages may be stored in the memory of the Model 200 at one time for display and review purposes. The unit does not contain a hard copy printing device. If a hard copy is required, the unit can resend any of the fax messages in its storage to a local fax machine.

60. The Model 200 is also capable of retrieving non-urgent fax messages over the landline telephone network from a fax store-and-forward communications system. With the explosion of fax communications, these systems are quickly being deployed in the marketplace. A fax store-and-forward system allows callers to leave fax messages in a "fax mailbox"

in a manner similar to that in which callers can leave a message in a voice mailbox. After a fax message is deposited in the mailbox, this system can forward a message to the GEM radio paging terminal in order to send a radio page to the Model 200. The alphanumeric message sent could indicate the nature of the facsimile message so that the subscriber can determine how soon he or she wishes to retrieve the message. When the subscriber is ready, the Model 200 can be used to call into the fax store-and-forward system and the fax message may be retrieved from the mailbox into the memory of the unit. The retrieval of non-urgent fax messages over the landline network reduces the overall radio spectrum requirements to provide this two-way fax communication service. The combination of radio transmission of urgent messages and landline retrieval of lower priority messages is a compromise which provides a powerful time-sensitive service to the subscriber while minimizing radio bandwidth allocation.

Support of Other Radio Receivers

Traditional Pagers

61. GEM paging receivers are not limited to Pagentry type devices. Traditional tone only, numeric, and alphanumeric display pagers operating in the high speed GEM paging format will be supported. These devices will operate in the same manner as pagers today, with the exception that the supported base of pagers on a single channel will be substantially larger

than any paging channel previously allocated to a licensee.

Data Paging

62. A special variation of a traditional display pager shall be manufactured for use within GEM. This receiver does not have any display capabilities and is primarily designed to accept binary data transmitted in GEM format. The receiver provides an interface which allows for its interconnection to laptop, palmtop, and other types of portable computing devices. Binary data specifically addressed to this receiver is assembled by the receiver and passed along to the mobile computing device. The information received could be updates to spreadsheets, data base information, electronic mail messages, facsimile messages, digitized voice information, appointment calendar updates, "to do" lists, telephone directory information, as well as thousands of other types of data, including computer programs to operate on the portable computing equipment. GEM will support industry standard mechanisms for the entry of binary data into a paging network as well as standard mechanisms to pass information between radio receivers and mobile computing devices. These standards are currently in development within Telocator Technical Committees and are expected to be adopted prior to FCC allocation of AMS radio channels. RTS is integrally involved in the creation of these standards, with Mr. Moskowitz of Real

Time serving as chairman of several of the Telocator technical committees.

Future benefits at other frequencies

63. The grant of a pioneer's preference to the Joint Venture will provide benefits to the paging industry at large and directly to the public in the conservation of existing radio frequencies. The granting of the preference will allow the Joint Venture to continue funding all of the research and development which has lead to the creation of the GEM concept. Once fully deployed and operational, the techniques and equipment which are developed as part of GEM will be made available in other variations, for use at other radio frequencies. This will have the effect of improving the performance and services over a wide range of channels. An enormous gain in the capacity of pre-existing channels along with the availability of receivers capable of taking advantage of these improvements while also providing enhanced features should result in a re-examination of how existing channels are being utilized before new frequencies are requested. Once the technology is fully available, a strong move should be made to encourage the better utilization of already granted frequencies before any new grants are allocated.

64. In the early days of paging, the two-tone radio paging format was very common. This time consuming analog page alert format could easily take in excess of 1.5 seconds to

alert a single tone-only pager. With paging formats in commercial use today, more than 60 tone-only pages can be transmitted in the same amount of time as a single two-tone page. The total number of subscribers utilizing the two-tone format who could be supported over a single channel would be one-sixtieth of that possible through the use of commercially available radio transmission formats. The availability of pagers operating in a more efficient manner causes carriers to plan on switching out old receivers for the new ones, in order to maximize the revenue stream which can be generated from adding subscribers to a single channel. With the availability of GEM technology, pagers utilizing formats in common use today will eventually be replaced with GEM pagers in the same way that two-tone pagers were replaced. The FCC should encourage the migration of pagers on existing overloaded channels to GEM technology before granting new frequencies to relieve congestion.

The availability of Pagentry Receivers and GEM paging technology

65. RTS intends to manufacture Pagentry Receivers for other firms which are granted a GEM license. It will also license GEM technology to other manufacturers for use on non-GEM radio frequencies so that the full benefits of more efficient paging techniques may be provided on pre-existing channels. The GEM paging format will be modified in several ways so that it may co-exist with existing paging formats.